

Osprey – OTS GSM / SMS Radio System

Introduction

The Osprey hardware is a addition to the OTS family. This device enables commercial GSM networks to be used to relay radio control data back to a collecting point.

Using the GSM network allows remote radio controls to be linked up with plug and play ease on the day of an event. Data can be sent to the arena or to any other GSM enabled device.

Data is collected from either SportIdent or EMIT timing hardware. Each packet received is stored in non-volatile memory and allocated a unique Record Number. This record is then transmitted via SMS across the GSM network to any phone number

An Osprey Terminal can be configured as the destination of the SMS messages. When used in conjunction with the Windows™ Osprey Management software, a laptop PC can be configured to recreate the original SportIdent or EMIT data stream.



Figure 1: Osprey Control

Osprey Control Technical Specification

Dual band EGSM900 & 1800MHz GSM modem.

2200mAh Rechargeable Li-Ion Battery (2 day operating life)

Storage for 16380 Records

Supported SportIdent Timing Hardware:

BSM7-D-RS232 configured as an AutoSend Control Station operating at 4800 baud

BSM7-D-RS232 configured as an AutoSend Download Station operating at 4800 baud

BSM6-D-RS232 configured as an AutoSend Control Station operating at 4800 baud

BSM6-D-RS232 configured as an AutoSend Download Station operating at 4800 baud

Note: when configured as a download station each card downloaded may occupy more than one Osprey Records, the number of records used will depend on the version of the SportIdent tag.

Version 5 Card = 1 Osprey Record

Version 6 Card = 3 Osprey Records

Version 6* Card = 7 Osprey Records

Version 9 Card = 2 Osprey Records

Supported Emit Timing Hardware:

Online Control operating at 9600 baud

In addition to standard mode, here is also an extended EMIT mode. In Extended mode, the Osprey unit inserts a TimeStamp into the EMIT packet to allow accurate time calculation on the receiving end. However the receiving software needs to support this mode.

Osprey Control External Interfaces:

SMA Dual Band GSM Antenna Connector
 9Pin Serial RS232 Male Connector (For Timing Hardware)
 Power switch
 SIM socket



Osprey Terminal Technical Specification

Dual band EGSM900 & 1800MHz GSM modem.

External Interfaces:

Dual Band GSM Antenna Connector
 Power Supply Connector
 9Pin Serial RS232 Male Connector (Connects to Osprey Manager Software)
 SIM socket

Osprey Ordering Information

<i>Order Code</i>	<i>Description</i>
GPP-OSP-CTRL	Osprey Control Kit
GPP-OSP-CTRL3	Osprey 3 Input Control Kit
GPP-OSP-TERM	Osprey Terminal Kit

Case Studies

Case Study 1 – Orienteering Radio Control

It was decided that for the commentary to be most entertaining and valuable to the spectators it was necessary to receive real time information as competitors in the Elite Classic race reached the furthest control.. Since the control was many miles from the finish arena and there was GSM coverage both in the arena and at the control site the Osprey hardware was selected.

To handle the number of competitors through the control more than one SportIdent Master Station was to be used, so an OTS-Merge unit was used to allow multiple stations to share a single Osprey Control unit

In the arena an Osprey Terminal adaptor was plugged into a computer running the Osprey Manager software. The Standard SportIdent data packets were recreated and fed into the OESpeaker software, which presented the data.

The use of the Osprey unit allowed the commentary team to give real time information on the positions of competitors as they reached the furthest point from the finish arena. This added interest and excitement to the event.

Case Study 2 – Fell Race Safety Checkpoint

The organisers of a multi-stage fell race needed to be certain that every competitor starting a stage in the race had successfully reached the end of that stage,

At the checkpoint, multiple EMIT online controls were plugged into an OTS-Merge which was in turn plugged directly into a Osprey Control Unit. As Each Competitor completed the stage, the system transmitted details of their arrival to the operations room of the event Using the SMS service. In the Operations room, the Osprey Terminal adaptor was plugged into a computer running the both the Osprey Manager and safety management software. Missing runner reports were generated every 10 seconds.

Fortunately there were no injuries, but the use of the system gave the runners and organisers confidence that should an accident have occurred, it would be noticed early, and rescuers sent to the correct place

Case Study 3 – Multi-Day Corporate Challenge

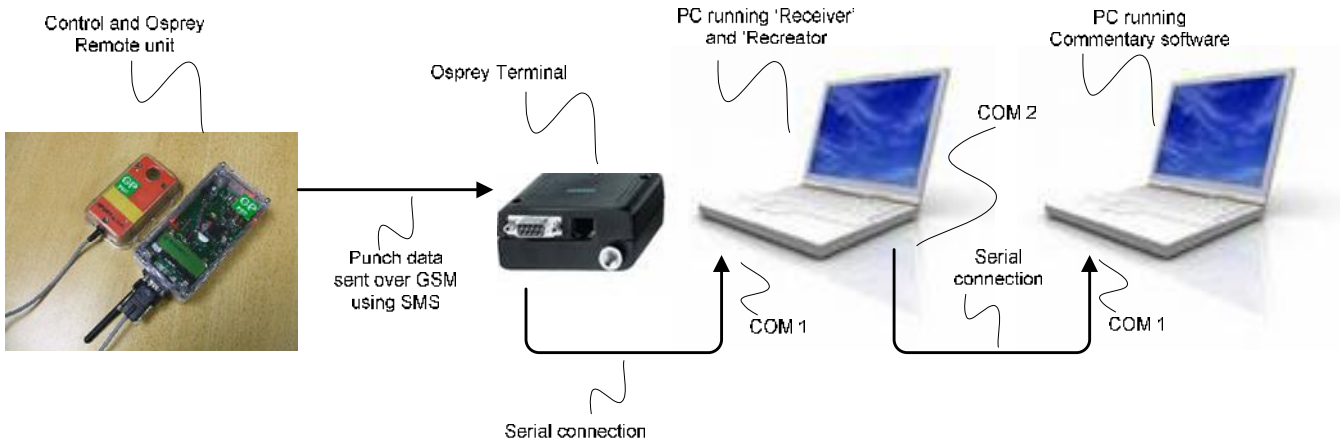
The organisers of a multi-day corporate challenge need to retrieve the data from the participants cards and publish the details on a website within an hour. They chose to Use Osprey Control Units to push the data directly to the web server using an SMS to email gateway. A background service on the webserver interpreted the data and updated the results page in real time.

The organisers were able to publish results within minutes - in fact before the participants had left the finish area and return to be debriefed.

System Setup

This section details how the Osprey system can be set up for use using a PC to re-create the data stream as it was originally generated by the control.

The diagram shows the components in the system that will be required.



Osprey Setup

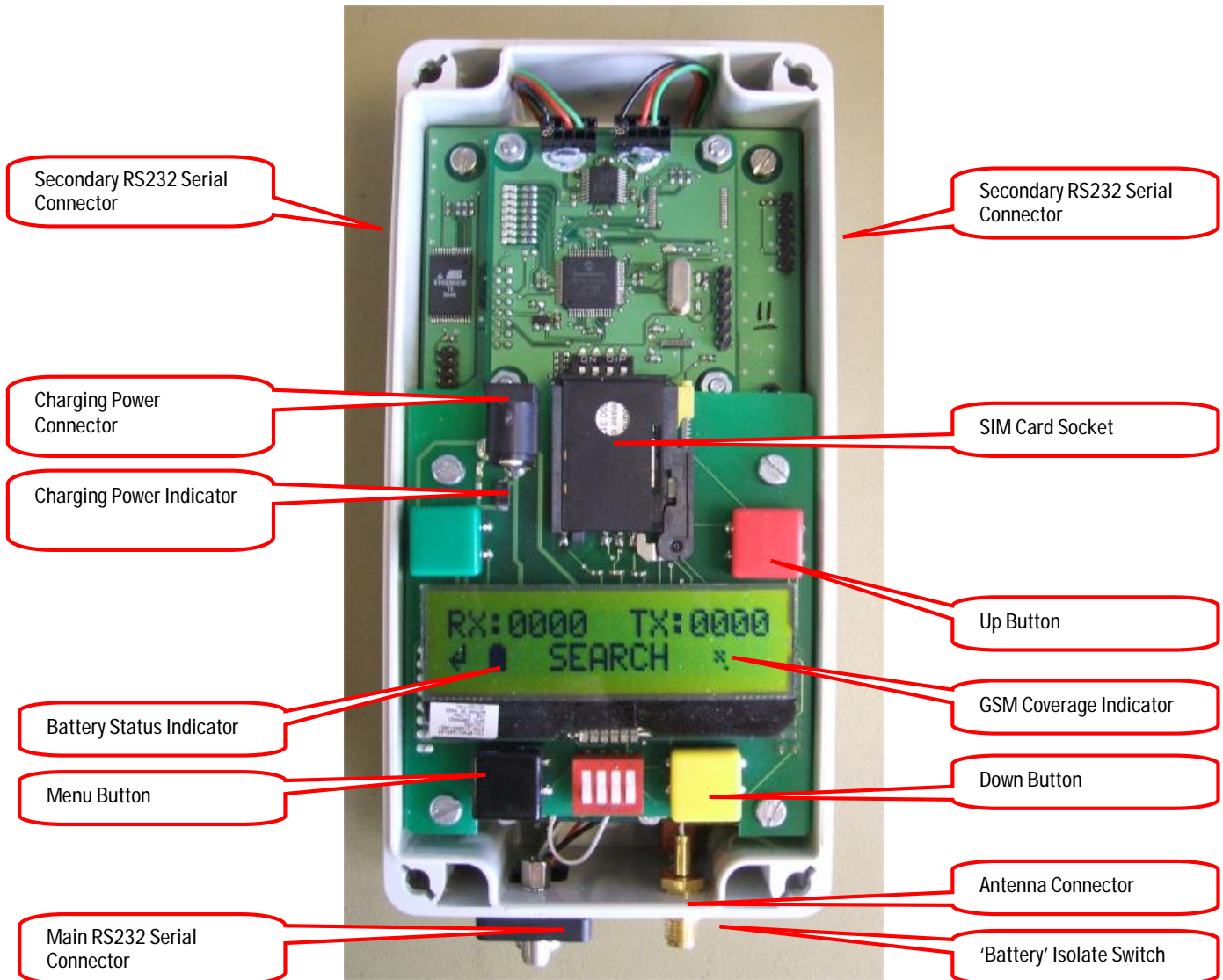


Figure 2: Anatomy of an Osprey

Osprey Charging

- 1) Charge the battery on the Osprey remote unit
 - a. Connect the charging adaptor to the power socket of the Osprey unit and switch the battery isolation switch to ON switch in quick succession.
 - b. Confirm that within 30 seconds the battery indicator on the screen confirms that the battery is charging.
 - c. The red charging power indicator by the power connector will also become lit.
 - d. The battery can be fully charged in less than 6 hours.
 - e. When charging is completed, remove the charger from the socket and switch the unit off

Note: It is possible to charge the unit while it is running. In this case, the unit battery isolation switch should be switched on first. When the unit has completed initialisation; connect the charging adaptor to the charging power socket of the unit.

- 2) Connect the Control unit to the serial port on the Osprey remote unit.

Osprey Configuration

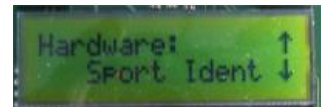
Osprey includes a menu driven configuration system. Typically the four buttons have consistent functions regardless of the menu system, these are as follows:

- Yellow – ‘Menu’ move to next menu item
- Green – ‘Default’ restore this setting to its factory default
- Red – ‘Up’ change the configuration up
- Black – ‘Down’ change the configuration down

Menu Hardware

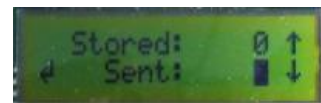
This menu selects what hardware is connected to the RS232 serial input, options are:

- SportIdent
- Emit
- Emit – Insert Timestamp



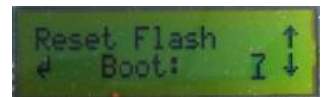
Menu Flash Status

This menu shows the current record archive memory status including the number or records received and stored from the control unit and the number sent to the GSM network. From this menu you can adjust the ‘Sent’ number which will cause the most recently received records to be resent.



Menu Boot Count

The boot count is a number that helps in time correction (Primarily used in EMIT). Normally it does not need to be changed. However usefully the green button here provides a quick method to ‘Reset Flash’, this resets both the Stored and Sent counters to zero and returns you to the previous screen for confirmation.



Menu Base Number

This menu configures the telephone number of the receiving / base device. This is the number where SMS messages are sent.

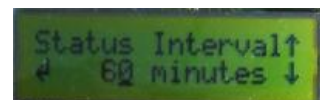
The maximum length of this field is 14 characters, if you need less then set the character to a blank space.

Examples: 07777123456 or 00447777123456



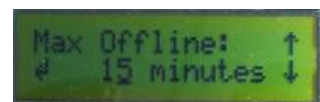
Menu Status Interval

The Osprey unit can automatically send a status message over the GSM network after a given period of no activity. This allows the receiving device to know if it has received all the data packets and the current status of the Osprey unit. To disable this feature set the interval to 0 minutes.



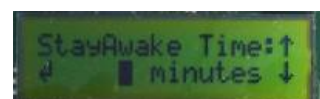
Menu Maximum Time Offline

The GSM modem in the Osprey unit is normally offline / asleep, this increases the battery life of the radio control. However if the base wants to communicate with the Osprey unit then it needs to periodically come online even if there are no new records to send. The Max Offline setting configures how often the modem comes online to see if the base is trying to communicate with it. The smaller this number the shorter the battery life, the longer this number then the longer you might have to wait for missing records to come through. Setting this time to 0 will cause the unit to stay online.



Menu Stay Awake Time

This GSM modem will remain online after sending a record to the base. When using power saving this provides a window of opportunity for the base to communicate with the Osprey unit.



Osprey Operation

The default screen for the Osprey unit shows the status of the device.

RX: Indicates the number of punch records received / stored

TX: Indicates the number of punch records delivered over the GSM network

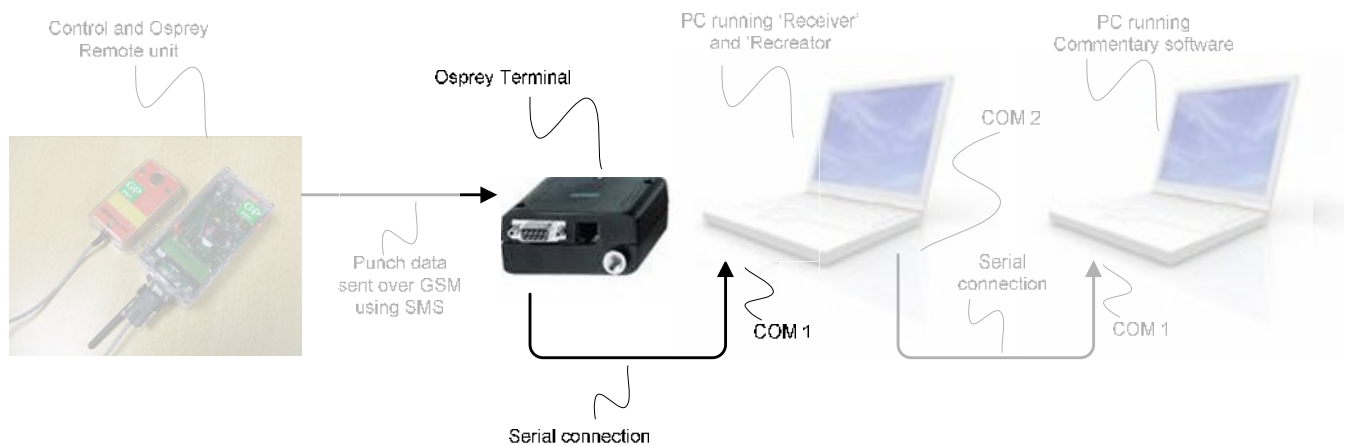
The bottom edge of the LCD indicates the status of the battery, the connected status and the signal strength on the GSM network. (Note the signal strength indicator is only valid when the GSM modem is online)



The connected status can have the following states:

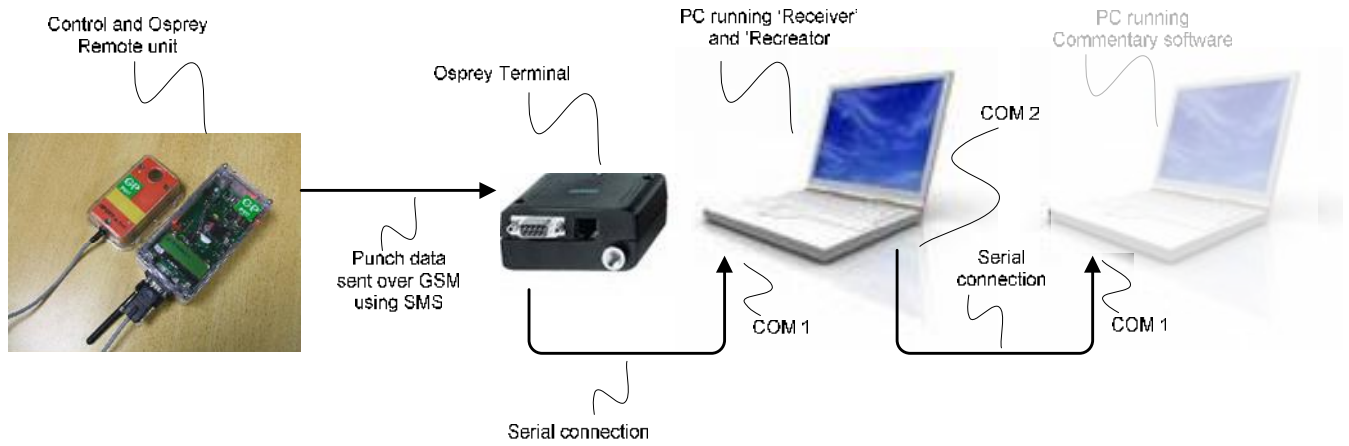
- RF OFF – The GSM radio is powered off and is asleep
- SEARCH – The GSM radio is searching for a network
- ONLINE – The Osprey has registered on a network
- ROAM – The Osprey has registered on a foreign network
- DENIED – The Osprey has been unable to register on a GSM network (Is there a SIM card inserted?)
- STAT TX – A status message has been sent
- SMS TX – A SMS message has been sent
- SMS ERR – An SMS failed to send (Do you have credit available on the SIM?)

Osprey Terminal Setup



- 1) Fit a SIM to the Osprey terminal unit. Note: There must not be a PIN set on the SIM
 - a. Press the yellow plunger with a ball point pen or similar to release the SIM card tray.
 - b. Fit the SIM to be used in the SIM card tray and slide the tray back into the holder.
- 2) Connect the Osprey Terminal unit to COM 1 of the PC that will be running the 'Receiver' and 'Recreator' software using a serial lead.
- 3) Connect the antenna to the Osprey terminal unit
- 4) Connect power to the Osprey terminal unit using the lead supplied. Note, Although there are two similar connectors on the osprey terminal unit, the power lead will only fit into the correct socket.

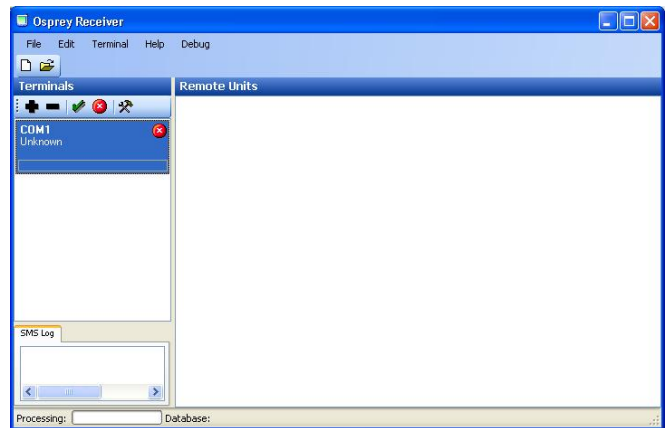
Receiver / Recreator Software Setup



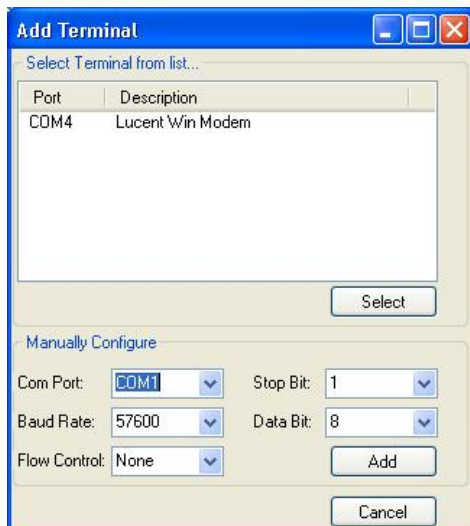
- 1) Connect COM2 from the 'receiver/recreator' PC to COM1 of the 'Commentary Software' PC using a NULL modem cable.
- 2) Start the 'Receiver/Recreator' PC. If you have been supplied this by GPP, the log in details are:

Username 'user'
 Password 'user'

- 3) From the shortcut on the desktop start the 'Osprey Receiver' software.



- 4) Create a new database by selecting: File → New Database
- 5) Call the database 'control' and use the location c:\user\eventdata\control.db



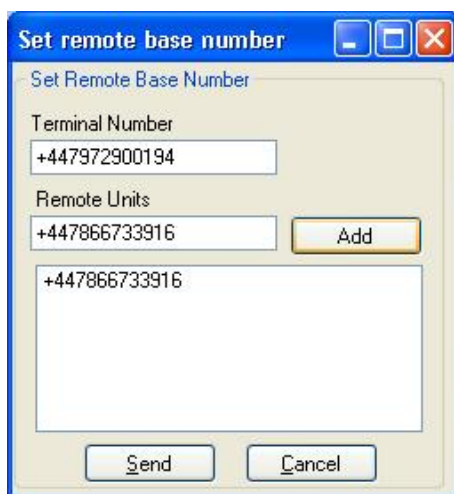
- 6) From the terminal menu, select Add to register to add the Osprey terminal hardware that is on COM 1
- 7) In the Add Terminal window either select the device if it has been detected automatically, or manually configure the port as shown below.

- 8) Select 'Add' to make the connection, Notice that the terminal appears on the left hand side of the main window.



- 9) Connect to the 'Osprey Terminal' by selecting: Terminal → Connect and verify the successful connection when the 'connection OK' box is displayed.

- 10) Notice that the terminal on the left hand side now includes a signal strength indication.



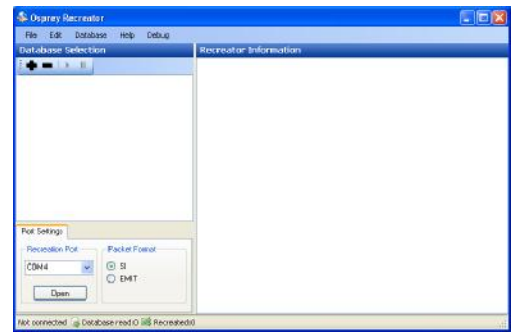
- 11) Configure the remote unit to send messages to the correct terminal. Phone number.

- a. Switch on the Osprey remote, and wait for it to display 'online' on the LCD display.
- b. From the Terminal Menu select 'Set Remote Base'
- c. In the dialog box, type the phone number of the terminal (connected to the PC) and the remote unit (connected to the control) as shown in the illustration below:
- d. Click 'Add' and then 'Send'. Observe the LCD display in the Remote unit which will briefly display 'Set base addresses and the phone number of the terminal to which it will be sending data.'
- e. If the LCD screen is cleared too quickly, press the green button to redisplay the number that the remote unit will be sending to, each time it sends a text

The Osprey Receiver Software has now been set up.

The next section describes starting the Recreator software on the 'Receiver/Recreator PC'

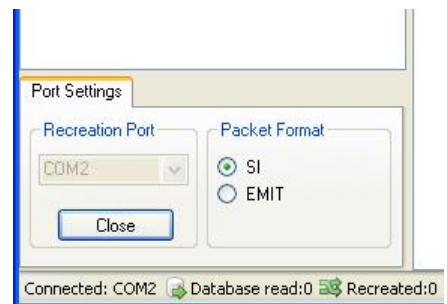
12) On the receiver/recreator computer, start the recreator software from the icon on the desktop



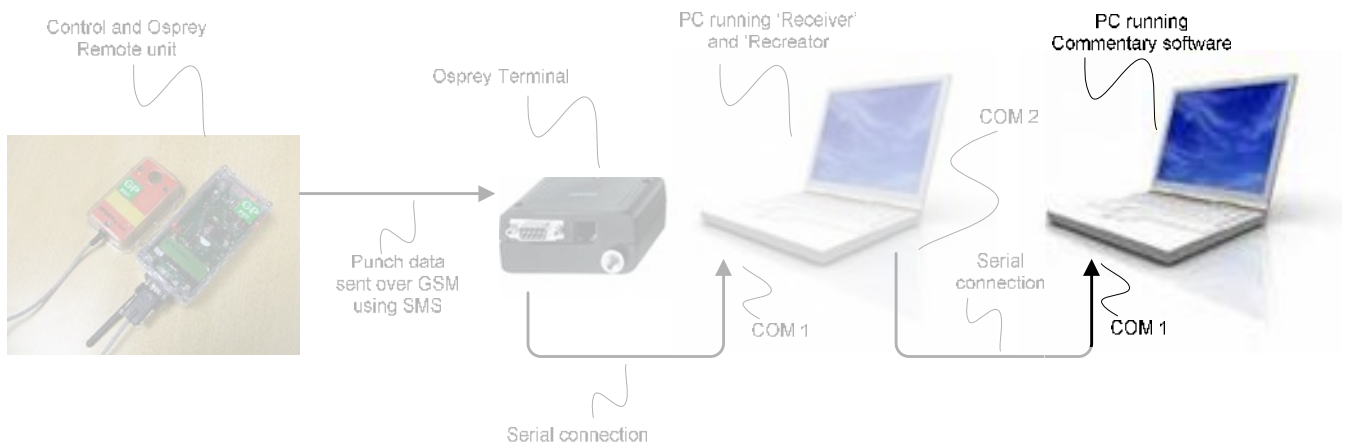
13) From the 'Database' menu, select "Add Database". In the dialog box browse to, and select, the database file that was created by the 'receiver' software

14) Observe that the database appears in the left hand pane, and may or may not include tables for the remote units that are in use. It is necessary to select both the database and the table. However, the table will only appear at the time a message has been received from the Osprey remote so it **may be necessary to revisit this step.**

15) Finally, select the packet format and the COM port that is to be used for the re-created stream and click the button to open the port. In the image, COM 2 has been chosen.



**The Osprey Recreator Software has now been set up.
The next section describes starting the Commentary software on the commentary PC**



16) On the PC to be used for the commentary, start the commentary software and select the COM port that is connected to the Receiver/ Recreator PC.

The system is now ready for use.

System Test

- 1) Insert a dibber into the control. Verify that the red LEDs in the Osprey remote unit flash indicating activity, and the LCD display is updated to show the contents of the record that is being sent by SMS
- 2) Check the right hand pane of the 'Receiver' software and observe that the message is received. This may take several seconds.
- 3) Check the right hand pane of the 'recreator' software and verify that the message has been read from the database.
- 4) Observe that in the information bar at the bottom of the 'recreator' window the 'database read;' and 'recreated' values are incremented
- 5) Check that the Commentary software is updated with the dibbed information

Advanced Receiver / Recreator Settings

There are a number of advanced settings that can be used to change the default timings in the receiver software. To change the advanced settings,

From the 'Edit' menu in 'Receiver' select the 'configuration...' menu item. This will bring up the configuration window.

Backup Frequency. This setting changes how often the software makes a backup copy of the database. At the specified interval a copy of the database is made in the backup subdirectory. Normally this will not be needed. The frequency of backups should be left at 20 minutes to avoid overloading the application.

Re-Request Frequency This setting determines the rate at which the application will automatically generate re-request messages for missing packets. Where the software is being monitored, it is recommended to increase this interval to several hours; effectively inhibiting automatic re-requests. Re-requests can be issued manually from the missing packets section of the Remote Units pane. Reducing the re-request frequency is not recommended as this can lead to thrashing.

Frequency of Polling Message Memory. This setting determines the interval at which the application scans the modem to ensure that there are no unprocessed messages. Normally messages are processed under URC control, and this setting should not be changed.

Use URC When selected, this option allows the software to respond to modem indications that new data is available. Normally this option should not be cleared, since this will increase the latency of processing received messages.

Auto Delete read SMS, Auto Delete sent SMS .When unchecked these options disable the deletion of SMS messages from the modem. Normally these boxes must remain checked to ensure that the modem memory will not fill up, and prevent the unit operation.



Appendix:

SMS Protocol

Osprey sends ASCII characters within the SMS packets. This is used for transferring the records and also configuring the unit.

DATA RECORD (Sent from Osprey to the configured base number)

SMS Payload: "d33330A4142434445464748494A"

d = Data Record

3333 = Record Part | Record Number (e.g 0x3333)

Mask with 0x3FFF to give the record number

Mask with 0xC000 to give the Record Part

0x0000 = Full Record

0x4000 = Record First Half

0x8000 = Record Second Half

0A = Number of bytes following (e.g 0x0A)

41424344454647484950 = Record Data (e.g. 0x41 0x42 0x4A or "ABCDEFGHJIJ")

The protocol supports the splitting of individual records across SMS's. This is achieved by using the top two bits of the Record Number. So Record Number 0x0001 is a complete record 1. 0x4001 is the first half of record 1. 0x8001 is the second half of record 1. These bits are ignored when Re-requesting records.

RECORD REQUEST (Sent to the Osprey unit)

SMS Payload: "r000200040007THRU30003002"

r = Record Request

0002 = Re-request Record Number 0x0002

0004 = Re-request Record Number 0x0004

0007THRU3000 = Re-records Records 0x0007 through to 0x3000

3002 = Re-request Record Number 0x3002

SET BASE NUMBER (Sent to the Osprey unit)

SMS Payload: "sbB07920100100"

s = Set Request

b = Base Number

B = number of characters following in hex (e.g 0xB)

07920100100 = New Base Number

GET STATUS (Sent to the Osprey unit)

SMS Payload: "gs"

g = Get Request

s = Status

STATUS RECORD (Sent from Osprey to the configured base number)

The Status record comprises the following Bytes:

srrrrllstbttimestcgbl

Where each character corresponds to a character in the message as described :

s Status Message. The character 's' indicating a status message

rrrr Packet id . 4 characters representing the packet id e.g. 1a06

st Status Message Two characters '73' indicating a status message

bt Boot Count Two characters indicating the number of times the unit has been power cycled e.g. 05. The value wraps at 0xff

timest Timestamp. Six ASCII characters giving a copy of the timestamp counter when the status message was sent. The timestamp counter is reset when the Osprey hardware is power cycled. The Time Stamp field counts up and wraps when it reaches 0xFFFFFFFF.

The timestamp counter runs from an internal 32.768kHz clock and increments 0.0078125 mS (128Hz).

Cg Charging Status. The value '07' indicates that the battery is currently being charged

BI Battery level The battery level indication in one of 5 steps 00, 14, .. 64 indicating battery remaining of 0%, 20% , ... , 100%

OVERTEMPERATURE RECORD (Sent from Osprey to the configured base number)

The Status record comprises the following Bytes:

```
crrrrllstbttimestcgb1
```

Where each character corresponds to a character in the message as described :

c Over Temperature Message. The character 'c' indicating an over temperature message

rrrr Packet id . 4 characters representing the packet id e.g. 1a06

st Status Message Two characters '73' indicating a status message

bt Boot Count Two characters indicating the number of times the unit has been power cycled e.g. 05. The value wraps at 0xff

timest Timestamp. Six ASCII characters giving a copy of the timestamp counter when the status message was sent. The timestamp counter is reset when the Osprey hardware is power cycled. The Time Stamp field counts up and wraps when it reaches 0xFFFFF.

The timestamp counter runs from an internal 32.768kHz clock and increments 0.0078125 mS (128Hz).

Cg Charging Status. The value '07' indicates that the battery is currently being charged

BI Battery level The battery level indication in one of 5 steps 00, 14, .. 64 indicating battery remaining of 0%, 20% , ... , 100%

CRITICAL VOLTAGE RECORD (Sent from Osprey to the configured base number)

The Status record comprises the following Bytes:

```
srrrrllstbttimestcgb1
```

Where each character corresponds to a character in the message as described :

v Critical Voltage Message. The character 's' indicating a Critical Voltage message

rrrr Packet id . 4 characters representing the packet id e.g. 1a06

st Status Message Two characters '73' indicating a status message

bt Boot Count Two characters indicating the number of times the unit has been power cycled e.g. 05. The value wraps at 0xff

timest Timestamp. Six ASCII characters giving a copy of the timestamp counter when the status message was sent. The timestamp counter is reset when the Osprey hardware is power cycled. The Time Stamp field counts up and wraps when it reaches 0xFFFFF.

The timestamp counter runs from an internal 32.768kHz clock and increments 0.0078125 mS (128Hz).

Cg Charging Status. The value '07' indicates that the battery is currently being charged

BI Battery level The battery level indication in one of 5 steps 00, 14, .. 64 indicating battery remaining of 0%, 20% , ... , 100% Normally 0% for a critical Voltage message.

SET RESET FLASH (Sent to the Osprey unit)

SMS Payload: "sf"

s = Set Request

f = Base Number

SET HEARTBEAT TIME (Sent to the Osprey unit)

SMS Payload: "sh32"

s = Set Request

h = Base Number

32 = Two character new timer value in hex (0x32 = 50 seconds)

SET MAXSLEEP TIME (Sent to the Osprey unit)

SMS Payload: "sz32"

s = Set Request

z = Base Number

32 = Two character new timer value in hex (0x32 = 50 seconds)

SET STAYAWAKE TIME (Sent to the Osprey unit)

SMS Payload: "sa32"

s = Set Request

a = Base Number

32 = Two character new timer value in hex (0x32 = 50 seconds)

EMIT Extended Mode

Since the EMIT online control packets do not contain a timestamp, if the commentary software wants to do any accurate timing calculations on the received data we recommend enabling the EMIT Extended Mode. In this mode the OTS hardware inserts a timestamp field into the EMIT packet immediately after the start of packet character.

<STX>"M"<OTS Hardware Address><Boot Count><Time Stamp><TAB><Rest of original EMIT packet...

<STX> = The original EMIT start of frame

<M> = Character 'M' to signify the Mode field

<OTS Hardware Address> = Two ASCII characters giving the OTS hardware address "30" = 0x30

This is used to identify the OTS hardware that inserted the Timestamp field

<Boot Count> = Two ASCII characters giving the Initialisation Counter "02" = 0x02. This is used to calculate the zero of the Timestamp field. This counter is stored in non-volatile memory and wraps when it reaches 0xFF.

<Time Stamp> = Six ASCII characters giving a copy of the timestamp counter when the packet was received. The timestamp counter is reset when the OTS hardware is rebooted and the boot count will be incremented at that moment too. The Time Stamp field counts up and wraps when it reaches 0xFFFFFFFF. The timestamp is sent Most Significant Byte first.

The timestamp counter runs from an internal 32.768kHz clock and increments 0.0078125 mS (128Hz).

Electrical Characteristics

The Osprey unit contains a rechargeable 2200mAH Li-Ion battery, and will operate from this for at least two days without needing to be recharged.

The charging / power input can accept between 5.5V and 8V DC and will draw 500mA when charging the battery.

Under normal operation the device will consume less than 1kW hour per year.